Safety and Health at Work xxx (xxxx) xxx

Contents lists available at ScienceDirect

Safety and Health at Work

journal homepage: www.e-shaw.org

Original Article

Prevention of Occupational Diseases in Turkey: Deriving Lessons From Journey of Surveillance

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ARTICLE INFO

Article history:
Received 4 January 2019
Received in revised form
2 August 2019
Accepted 23 September 2019
Available online xxx

Keywords:
Intersectoral collaboration
Occupational diseases
Occupational health
Prevention
Worker's health surveillance

ABSTRACT

Introduction: To prevent and manage the societal and economic burden of occupational diseases (ODs), countries should develop strong prevention policies, health surveillance and registry systems. This study aims to contribute to the improvement of OD surveillance at national level as well as to identify priority actions in Turkey.

Methods: The history and current status of occupational health studies were considered from the perspective of OD surveillance. Interpretative research was done through literature review on occupational health at national, regional and international level. Analyses were focused on countries' experiences in policy development and practice, roles and responsibilities of institutions, multidisciplinary and intersectoral collaboration. OD surveillance models of Turkey, Belgium and the Netherlands were examined through exchange visits. Face-to-face interviews were conducted to explore the peculiarities of legislative and institutional structures, the best and worst practices, and approach principles.

Results: Some countries are more focused on exploring OD trends through effective and cost-efficient researches, with particular attention to new and emerging ODs. Other countries try to reach every single case of OD for compensation and rehabilitation. Each practice has advantages and shortcomings, but they are not mutually exclusive, and thus an effective combination is possible.

Conclusion: Effective surveillance and registry approaches play a key role in the prevention of ODs. A well-designed system enables monitoring and assessment of OD prevalence and trends, and adoption of preventive measures while improving the effectiveness of redressing and compensation. A robust surveillance does not only provide protection of workers' health but also advances prevention of economic losses.

1. Introduction

Occupational diseases (ODs) are diseases causally related to work. In many countries, OD is a concept perceived to be closely related to financial and other compensations. Therefore, the term "work-related disease" is introduced for diseases causally related to work but not officially recognized in a country as a compensable OD. Examples are work-related depression, burnout, chronic obstructive pulmonary disease, cardiovascular diseases, and chronic low back pain. The reasons not to compensate differ between countries. Many countries mention the multicausality of a disease as the main reason, but costs of compensation might play a

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2093-7911/$ – see front matter
https://doi.org/10.1016/j.shaw.2019.09.006

Please cite this article as: Şen S et al., Prevention of Occupational Diseases in Turkey: Deriving Lessons From Journey of Surveillance, Safety and Health at Work, https://doi.org/10.1016/j.shaw.2019.09.006

role as well. In this article, we use the term OD to safeguard readability, not aiming to exclude work-related diseases.

ODs impose considerable costs to workers, health care systems, and society also reducing the productivity [1]. The International Labour Organization (ILO) estimates that 160 million people globally are affected by occupational (work) accidents and work-related diseases each year, and 2.78 million people die for the same reasons. This "hidden epidemic" results in an estimated minimum loss of 4% of global gross domestic product, or about $2.8 trillion, direct and indirect costs [2,3].

ODs are diseases with an obvious cause, presumed to have a "direct causal" relationship between disease and work, even when multicausal in origin as almost all diseases. ODs are "preventable" when the necessary measures are taken. They can be progressive and recurrent unless diagnosed, cured, and preventive measures are taken [4].

To develop preventive policies, it is essential to know incidences, prevalences, distributions, and trends [5]. According to ILO conventions (C155 and C187), all countries are expected to maintain an OD registration system [6]. Challenges faced due to socioeconomic and political developments such as the increase of self-employed, informal and migrant workers, often affect policies and applications for prevention. In some countries, the system is focused on early diagnosis and prevention analyzing trends and detecting new or emerging ODs, whereas in other countries, emphasis is put on diagnosis of each OD case resolving the suffering, rehabilitation, and compensation.

OD records are rich sources of information, fit for research and statistical overviews, allocation of prevention and development of new diagnostics [5]. Therefore, surveillance, a vital instrument to fight against communicable diseases, can be used to develop prevention policies for ODs. Monitoring well-known ODs through standardized procedures is often distinguished from open alert systems needed for detecting new or emerging ODs.

The purpose of this article is to present lessons to improve the system in Turkey based on the evaluation of studies on OD surveillance and registration systems, and on discussions with experts during exchange visits to Belgium and the Netherlands in 2017. Comparative information has been provided about the situation in the three countries. Enriching the analyses with literature studies, it is aimed to create a study providing guidance and recommendations for policymakers.

2. Materials and methods

This article is based on studies [7] performed in the project for Strengthening the Occupational Health Expertise and Scientific Capacity of the Public Health Institution of Turkey (ESPrIT) [8]. In addition to Turkish institutions, exchange visits were made to Belgium and the Netherlands in April-May 2017. Face-to-face discussions were held in 42 sessions with 20 public and private institutions in the area of Occupational Safety and Health (OSH) and ODs. All stages of this study were planned, and discussion topics and questions were shared in advance. The legislation and institutional structures of the countries, disciplines and organizations in OSH systems, and principles of approach were examined under 11 headings.

In addition, a literature review was made on OD surveillance systems, policymaking and implementation experiences, main actors in socioeconomic and political processes, and protection of health through cross-sector cooperation. A search was performed in PubMed, Google Scholar, the ESPrIT e-library, and national postgraduate theses and dissertations. Articles were retrieved using English and Turkish keywords including "occupational disease," "work-related disease," "surveillance," "registration system," "registry," and "notification."

3. Results

The findings have been summarized in Table 1.

3.1. Definition of occupational disease

The concept of OD exists in Belgium, but a real definition is not provided in the legislation. In the Coordinated Laws [9] (Article 32), only occupational risk is defined as the exposure to a damaging agent inherently associated with the profession, an exposure markedly larger than that of the population in general, and the exposure is the main cause of the disease in groups of exposed persons according to generally accepted medical knowledge. In the Netherlands, according to the Working Conditions Act (*Arbowet*) [10], OD is defined as a disease or incident caused by heavy performance of work or high exposure to working conditions, and includes work-related diseases as compensation of ODs is not regulated by law. In Turkey, OD is defined separately and differently in two laws. According to Article 3 (l) of the Occupational Health and Safety Law no. 6331, OD is "any disease caused by exposure to occupational risks." Whereas, according to Article 14 of the Social Security and Universal Health Insurance Law no. 5510, OD refers to "the temporary or permanent conditions of disease, physical or mental handicap, caused by a recurrent reason due to the quality of the work performed by the insured or to the working conditions."

3.2. Diagnosis and diagnostic facilities

All doctors in Belgium have the possibility and right to make a diagnosis in case of a suspected OD. Then the employee is referred to the Federal Agency for Occupational Risks (*FEDRIS*) for the official diagnosis and compensation procedures. A mixed system consisting of a list of recognized ODs and an open system is used. For diseases on the list, two conditions need to be fulfilled: (1) compliance of the disease to the diagnostic criteria of *FEDRIS* and (2) exposure to the associated occupational risk. There is a legal presumption in the list system of the causal relationship between the disease and exposure.* If the disease is not on the list, a claimant can try to obtain recognition using an open system, proving (1) exposure, (2) existence of the disease, and (3) the casual relationship between both. In the open system, strong scientific evidence of the casual connection should be warranted since a "direct and determinative" causal link needs to be established. All costs are covered by *FEDRIS*.

Occupational physicians in the Netherlands diagnosing an OD, are obliged to notify the Netherlands Center for Occupational Diseases (*NCvB*) using an electronic form based on six-step approach [11] including information on the OD and line of work (Nomenclature of Economic Activities (*NACE)* and International Standard Classification of Occupations (*ISCO)* codes). The *NCvB* offers guidelines, training materials, and expert support [7]. Special centers are available, e.g. for diagnosing occupational dermatoses, respiratory diseases, noise-induced hearing loss and neurological diseases, especially Chronic Solvent-Induced Encephalopathy [12].

* As example: for the recognition of laryngeal cancer caused by asbestos, asbestos occupational exposure should have been started at least 20 years before the onset of the disease and the exposure should be at least 25 fiber years (fiber years = Σ *Ci •Ti* (Ci = number of fibers/cm^3 air and Ti = years of exposure). For the recognition of epicondylitis caused by repetitive strain injuries, the biomechanical overload score should be $\geq$14.1 evaluated with the occupational repetitive action checklist.

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Table 1
Summary of findings on OD surveillance systems in Belgium, the Netherlands, and Turkey

	Belgium	The Netherlands	Turkey
1. Definition of ODs	NO (not in the law, only definition of occupational risk)	YES (including work-related diseases)	YES (two definitions in two laws)
2. Diagnosis of ODs	National OD list and an open system	An open system with referral to EU OD list 2003/670/EC	National OD list (≈ILO) and an open system
3. Awareness and trainings	Tools: OSH publications, website of FPS Employment (www.emploi.belgique.be), website of the Belgian Safe Work Information Center (www.beswic.be), seminars, formal trainings and education, demonstration laboratories Target population: Employers, employees, OSH professionals, students, general public	Tools: OSH catalogues, *Arboportaal* website (for employers and employees) (www.arboportaal.nl) of Ministry of Social Affairs and Employment, *Arbokennisnet* website (for OSH professionals) (www.arbokennisnet.nl), and OD website (https://www.beroepsziekten.nl/) of the *NCvB* including OD descriptions and criteria, and annual 'Key figures of ODs' Target population: Employers, employees, OSH professionals, students, general public	Tools: OSH guidelines, website of the *ÇASGEM* (www.casgem.gov.tr), website of MoFLSS (isgkatip.csgb.gov.tr), formal trainings and education, public campaigns, TV spots Target population: Employers, employees, OSH professionals, students, general public
4. Collaboration and communication between institutions	*FEDRIS*, FPS Employment, Labour and Social Dialogue, OSH service providers (internal and external), social partners	*NCvB*, *TNO*, *RIVM*, *ISZW*, OSH service providers (internal and external), social partners	MoH, MoFLSS, *SGK*, NCOSH, OSH service providers (internal and external), social partners
5. Prioritization	Prevention vs. compensation, decrease work incapacity	Prevention of occupational accidents and ODs (risque professionnel) and diseases causing sickness absence (risque sociale) the most frequent ODs (work stress, musculoskeletal diseases), and the most serious ODs (effects of exposure to hazardous chemical substances)	Prevention of occupational accidents and ODs through seven main goals including improvement of OD surveillance system and registry
6. Legislation	Coordinated Laws on ODs, June 3, 1970 Code of well-being at work (*Code du bien-être au travail*) (Council Directive 89/391/EEC)	Working Conditions Act of the Netherlands (*Arbowet*) (Council Directive 89/391/EEC)	Laws # 6331 and 5510 Bylaws and regulations
7. Notification and registry	Occupational physician, general practitioner (the same as family physician in Turkey), all clinical specialists, *FEDRIS*	Occupational physician *NCvB*	Occupational physician, family physician, ODs hospitals, authorized (other) hospitals, *SGK*
8. Statistics and reporting	*FEDRIS*	*NCvB*	*SGK*
9. Surveillance process (type)	Monitoring	Monitoring and alert	Monitoring
10. Intervention	Employer: prevention adviser, internal OSH unit, external OSH service providers (non-profit) *FEDRIS*	Employer freelance occupational physicians or multidisciplinary OSH service providers (internal or external)	Employer: internal OSH units (*ISGB*), external OSH service providers (*OSGB*), MoFLSS, MoH
11. Compensation and appeal	*FEDRIS*	No special arrangement; general health insurance and social security (except for mesothelioma and asbestosis)	*SGK*

ÇASGEM, Center for Labour and Social Security Training and Research; EC, European Commission; EU, European Union; *FEDRIS*, Federal Agency for Occupational Risks; FPS Employment, Federal Public Service of Employment, Labour, and Social Dialogue; ILO, International Labour Organization; *ISGB*, Occupational Safety and Health Unit; *ISZW*, Labour Inspection; MoH, Ministry of Health; MoFLSS, Ministry of Family, Labour and Social Services; NCOSH, National Council of OSH; *NCvB*, Netherlands Center for Occupational Diseases; OD, occupational disease; *OSGB*, Common Safety and Health Unit; OSH, Occupational Safety and Health; *RIVM*, Netherlands National Institute for Public Health and Environment; *SGK*, Social Security Institution; *TNO*, Netherlands Organisation for Applied Scientific Research.

No national list is created for ODs, but the European Commission Recommendation 2003/670/EC of September 19, 2003 (European schedule of ODs) is accepted as reference.

The OD diagnostic process in Turkey consists of two phases: a prediagnosis and final diagnosis. An employee prediagnosed with an OD by an occupational or other physician can apply to the Social Security Institution (*SGK*) for the final diagnosis and compensation. Then the applicant is referred to an authorized hospital for the medical diagnosis (costs are covered by *SGK)*. Next, the Health Committee of *SGK* concludes if the case is an OD or not, deciding also the right to compensation. The list of ODs is published as Annex 2 of the Regulation on Assessment of Incapacity for Work and Loss of Earning Capacity Rate [13], which is similar to the grouping of the ILO list. The open system is used for diseases not on the list.

3.3. Awareness and trainings

In Belgium, the Federal Public Service Employment, Labour and Social Dialogue (FPS Employment) offers information, documentation, and copies of collective labor agreements and training courses to improve the quality of work. Publications are also available on the website of the Belgian Safe Work Information Center, also focal point of EU-OSHA (www.beswic.be). This center organizes seminars, workshops, campaigns and provides free access to demonstration laboratories. *FEDRIS* manages campaigns to prevent ODs.

In the Netherlands, as part of the studies by the European Commission for improving OD notifications, the *NCvB* was established and regulated by *Arbowet* in 1999. Today, awareness raising activities and trainings are carried out by *NCvB* [7]. Guidelines for

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occupational physicians are prepared by the Netherlands Society of Occupational Medicine *(NVAB)*. National awareness raising networks are active such as *Arboportaal* (health and safety portal) informing employers, employees, and others, and *Arbokennisnet* (OSH information network) supporting OSH professionals [14]. Employer and employee representatives have developed sector or branch-specific OSH catalogues offering companies instruments for better managing working conditions. The Ministry of Social Affairs and Employment supports prevention programs to increase awareness, promoting more say for occupational physicians in prevention and ensuring that OSH experts are supported in risk assessments [7].

In Turkey, OSH guidelines and handbooks are published, and campaigns are organized by the Ministry of Family, Labour and Social Services (MoFLSS) and affiliated institutions. To promote awareness and notification of ODs, the Ministry of Health (MoH) organizes trainings and creates standard guidelines for family physicians, occupational physicians, and primary healthcare staff. In addition, the MoH developed software [15] to monitor trainings provided by its OSH professionals. In-service trainings are provided for the inspectors in the Labour Inspection Board to learn about new developments [16]. In addition, many groups are active under professional bodies, trade unions, and OSH professionals. A joint project carried out by the Ministry of National Education and MoFLSS at schools promotes a good OSH culture in early years [17].

3.4. Collaboration and communication between institutions

The main actor within the area of ODs in Belgium is *FEDRIS*, managed by a chairperson, employers' and employees' representatives. According to the Act of August 4, 1996 on well-being of workers in the performance of their work (Law on well-being at work), OSH services are compulsory for each company whatever the type of activity or hazards. Employers with $\geq$50 employees have to set up a committee on prevention at the workplace with representatives from the employer and workers [18].

In the Netherlands, communication between institutions is based on tripartite social dialogue including state, employer, and employee representatives. According to *Arbowet*, a safe and healthy workplace is the joint responsibility of the employer and employees. This responsibility is binding at business, sectoral, and national levels. In this "Poldermodel," all parties participate in the policymaking process and decisions are taken by consensus [14].

In Turkey, the National Occupational Health and Safety Council is established as an official mechanism where the state, employer, and employee representatives create a dialogue (Law no. 6331). The employer is responsible for fulfilling OSH at the workplaces (article 8), whereas OSH committees shall be established (article 22) and OSH coordination shall be maintained at sectoral level (article 23).

3.5. Prioritization

In Belgium, in the past, the emphasis was put solely on financial compensation of the victims. Nowadays, actions preventing the disease and decreasing work incapacity gain priority. A good example is the secondary prevention program of low back pain.

In the Netherlands, policy is focused on occupational accidents and ODs (*risque professionnel*) and on common diseases associated with sickness absence (*risque sociale*). For prevention, emphasis is put on the most frequent ODs such as musculoskeletal diseases and work stress, and on serious ODs such as diseases caused by exposure to hazardous chemical substances.

In Turkey, priorities are set by the MoFLSS in accordance with the strategic planning by the National Health and Safety Council. In the third National OSH Policy Document (2014-2018) [19], the second and fourth main goals out of seven are to improve the OD surveillance system and registry. In the assessment of ODs, MoFLSS focuses mostly on work safety and on compensation, whereas MoH analyses medical data coming from the health automation system (ICD-10 codes).

3.6. Legislation

In Belgium, OSH area is mainly regulated by the Law on well-being at work, which has transposed the Framework Directive no. 89/391/CEE on health and safety of workers into Belgian legislation. Its implementing decisions (Royal Decrees) apply to every employer who employs workers. Other current OSH regulations also refer to European standards or to terms such as "codes of practice" and examples of "good craftsmanship" [20].

Contemporary texts regulating OSH and ODs in the Netherlands are the *Arbowet* (1980, 1999) and the Working Hours Act (1996). The *Arbowet*, still in force, has been amended in 1994 to transpose the EU legislation; significant amendments have been made even recently. This law focusing on objectives and responsibility of the employer and employees, defines the objectives and framework but not how to achieve the targets. So, general statements indicate that the employer needs to have a written OSH policy. Details are adjusted in secondary legislation (decrees and regulations) [14].

In Turkey, the current Law no. 6331 (since 2012) includes details on the definition, diagnosis, and notification of ODs. Rights to compensation are regulated in the Law no. 5510. However, each law has a different definition of OD. Law no. 6331 defines OD in relation to occupational exposure, defines a notification-registration system and emphasizes occupational risks. The definition in Law no. 5510 regulates the insurance procedures, incapacity for work and loss of earning capacity, and provisions of compensation stemming from the right to work. Implementation of the laws and technical details are laid down in regulations and directives.

3.7. Notification and registry

In Belgium, there is no strict algorithm for OD notification. *FEDRIS* collects OD data of the employees who personally apply for compensation. Separately, occupational health services have to send annual reports to FPS Employment, which include an overview of OD notifications by the engaged occupational physicians. The ICD-10 coding is usually carried out by *FEDRIS*.

In the Netherlands, OD figures are based on information from different sources [21]. The OD registration system monitors trends for a certain OD and the related sector, whereas individual cases are evaluated for new or emerging cases of OD. The notification and registries in the *NCvB* databases have no relation with compensation of individual cases. The objective is to monitor sectoral OD incidences/prevalences and trends, and to produce early warnings for prevention [21]. For better quality figures, data from a sample of committed occupational physicians are used [22].

In Turkey, occupational or other physician prediagnosing OD cases is obligated to notify the employer and to send those cases to authorized health institutions (Law no. 6331). These institutions and the employer have to notify cases of OD diagnosis to *SGK* for the final decision. According to Law no. 5510, *SGK* has the tasks of finalizing the OD diagnosis, publicizing OD statistics, carrying out General Health Insurance processes and formal procedures for the compensation of ODs.

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3.8. Statistics and reporting

In Belgium, *FEDRIS* publishes its annual activities on its website. The annual statistical report on ODs provides information in large tables with descriptive statistics but lacks detailed analysis.

In the Netherlands, the main source is "Key figures of ODs" (*Kerncijfers beroepsziekten*) [23]. Also Health and Safety Balance Report (*Arbobalans*) [21] includes measures taken for work-related health, occupational risks and effects, high-risk occupations and sectors, and studies conducted in companies.

In Turkey, annual statistics on ODs and occupational accidents related to compensation are published by *SGK*. *SGK* is in close cooperation with the Turkish Statistical Institute (Turkstat) to share high-quality data using methodology recommended by Eurostat [24].

3.9. Intervention

In Belgium, the department of Expertise and Prevention of *FEDRIS* carries out risk assessments. Prevention experts investigate diseases and assess occupational risks by measurements. Sectoral experts produce estimates related to compensation. OD treatment is provided by regular health care institutions, as there are no clinics or hospitals specialized in ODs. The worker/patient chooses the doctor or service. *FEDRIS,* not directly involved with the treatment, covers the medical costs and organizes adaptation trainings for another job and rehabilitation programs for workers affected by some specific ODs (e.g. asthma due to isocyanates), especially when workers have to quit their job to avoid exposure to a specific agent [7].

In the Netherlands, strategic actions are planned to develop commitment and competences of employers and employees. Development of adequate knowledge and culture at workplaces is the most important political objective for prevention of work-related diseases. Agenda setting, supporting, standardizing, maintaining, and monitoring are key areas of action [14]. There is no separate disability fund for OD treatment and rehabilitation. In general, OD-related medical expenses are covered by regular health insurances. Only in special cases, the employer covers the costs through private insurance or direct payment.

In Turkey, the 2017—2021 strategic plan of MoFLSS [25] includes improvement of statistical data for ODs and occupational accidents. Development and maintenance of OSH services, and preventive and risk-based inspections are also included. OSH provisions consist of risk assessments, preventive and regulatory activities, employee trainings, working environment surveillance, and periodic employee health examinations. These activities are significantly supported by OSH committees at workplaces with $\geq$50 employees. Treatment and rehabilitation can be provided by regular health institutions or by ODs hospitals and rehabilitation hospitals.

3.10. Compensation and appeal

In Belgium, the key approach in the event of an OD or occupational accident is not aggrieving the victim. All losses incurred are covered by *FEDRIS*. Medical costs are not redirected to the employer, in absence of a deliberate intent or lack of measures. Even the losses and expenses incurred by informal workers are paid to the victim by *FEDRIS*, but *FEDRIS* redirects these to the employer [26]. In case of any appeal, the labor court appoints an expert who decides whether it is an OD or not.

In the Netherlands, no regular legal compensation mechanism for ODs and occupational accidents exists (exceptions: mesothelioma and asbestosis). In case of work disability, independent of the work-relatedness of the cause, the salary of all employees is continued for two years by the employer for a percentage determined by law. After two years, the *SGK* makes an assessment to determine about continuation of payment of a disability pension by this institution [27].

In Turkey, a causal link is required between the work performed and the disease included in the OD list, for temporary or permanent incapacity allowance arising from ODs or occupational accidents. Payment is made by *SGK* according to the legislation regarding loss of earning capacity. In case of appeal, the *SGK* Higher Medical Board makes the final decision, and parties can file a suit against each other according to the Turkish Code of Obligations.

4. Discussion

One of the main objectives of OSH systems and legislation is to prevent ODs and occupational accidents. Countries carry out national, sectoral, and patient-based surveillances for monitoring ODs' incidences, prevalences, and trends. The rate of achievement of targets is increased when surveillance data are used identifying areas of prevention, especially with high risks, needed for the development of proper preventive actions.

In this study, the results were assessed through combining the four-step approach for development of OD surveillance [28], the Plan-Do-Check(Study)-Act cycle and three levels of prevention in public health [29], the surveillance performance indicators [30], and components of hospital infections surveillance system [31]. "Notification and registration process", "collaboration and communication between institutions", "statistics and reporting", and "awareness and trainings" are the critical factors of surveillance systems for both monitoring and alert purposes. The definition and diagnosis of ODs have been discussed along with the country legislation and applications as key factors.

4.1. Definition and diagnosis of ODs and the relationship between legislation and application

It is important to include the definition and basics of diagnostics of ODs within the legal framework during conceptualization as the first stage of creating OD surveillance. Likewise, we see that the definition and diagnosis have been included within the legal framework despite some differences. Systems for monitoring purposes address ODs on a case-by-case basis, often but not always based on social insurance cases, useful for sectoral monitoring and tracking disease trends. Systems created for alert purposes identify new or emerging ODs, no strict rules are followed. Suspected high rates can be the result of data analysis or start with one unusual clinical case [32].

When the practice of social insurance is prominent, only those OD cases entitled to compensation are included in the statistics. Thus, the exclusion of OD cases with no substantial consequences for work capacity undermines, even unintentionally, the priority of primary prevention. On the other hand, in the practices focusing on the prevention of ODs being the primary level of protection in public health, through sectoral monitoring and disease trend tracking, the secondary and tertiary health protection need to be improved. A dedicated social security tool is needed especially for the victims catching an OD who cannot live on their own and need care.

As in Belgium, some countries consider the existence of relevant exposure at the workplace sufficient for a case, if included in the OD list. The effect of confounding factors is not reviewed. A more or less "proven" causal link is only required for the open system. In other countries, such as Turkey, which have a stricter application, a causal link on individual basis between the OD and the work performed is required. However, confirming a causal link for every case makes

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the process to identify OD cases more difficult and time consuming, and thus causes the figures to remain low. Moreover, the causality of a disease is not sufficient as a certain degree of work incapacity is used as a second criterion, stemming from the social insurance perspective.

In Turkey, OSH activities and diagnostic processes of ODs are regulated by Law no. 6331, whereas figures of ODs in the official statistics show only cases finalized according to the Law no. 5510, so receiving rights to compensation. Another issue hindering prevention activities because of the lack of reliable and complete OD statistics is the exclusion of the informal, uninformed, or retired workers.

Lawsuits in OSH in Turkey (excluding, e.g. those related to Penal Code or Code of Obligations) constitute another factor causing low figures. Employers and/or employees can file lawsuits against each other, the administration, the physicians and/or health care institutions that make the diagnosis, because of the diagnostic process and/or compensations. These lawsuits cause uneven distribution of OD cases over the years and low annual statistics. Lawsuits against the physicians or health care institutions make them reluctant to diagnose and notify an OD. Moreover, it can even result in annulment of occupational physician's certificate when an employee catches an OD [33].

In Turkey, medically diagnosed cases of ODs by the authorized health institutions are about 4500 to 5000 annually, but only approximately 500 of these cases are reflected on the statistics after *SGK* committees' review [34,35]. To improve diagnosis capacity, ODs hospitals' authority has been expanded to some hospitals of MoH and the universities. Nevertheless, the lack of standardized hospital forms prolongs the process.

4.2. Notification and registration process

OD notification and registration is critical for the follow-up, rehabilitation, and compensation of individual cases, and for monitoring sectors and disease trends, and crucial for developing protection policies. Increase of ODs in the aging population can increase the OD burden across the world [36]. According to global estimates, 45% of the deaths attributable to occupational risks are caused by work-related cancers (489,000 of 1,086,000), whereas 18% of the total results from workplace injuries (204,000) [37]. Therefore, prevention of work-related cancers is critical to avoid a significant public health problem for ethical and economic reasons.

As occupational physicians and family physicians providing preventive services play an important role in the notification and registration process, their collaboration becomes inevitable. Although Turkey is more advantageous in the number of 14,000 active occupational physicians compared to approximately 1,100 in Belgium and 1,800 in the Netherlands, their role as preventive service providers needs to be improved. Occupational physicians need to increase their knowledge of risk exposures at work and focus more on studies demonstrating new or emerging health hazards. They need taking a wide range of new roles and responsibilities such as decision-maker, communicator, guide, change agent, leader, and manager [38].

OD surveillance systems provide data for further scientific studies and evaluation of regulations and interventions [39], and stimulate developing new methods in the analysis of data [40].

4.3. Collaboration and communication between institutions

OD surveillance requires communication and collaboration between institutions to enable approximation of institutional perspectives and transformation of institutional goals into national priorities, contributing in reaching the national targets. Although each country has different versions, there is a basic collaboration mechanism defined as dialogue between social parties, which brings together the regulating authority (state), employees, and employers.

For the regulating authority, the OD surveillance system should be set up and run in a way that the preventive health and the insurance sides will not hinder each other. In countries with a separate structure dedicated to ODs (e.g. an institution for ODs), this balance is achieved more successfully. Where the social security actors (e.g. MoFLSS) and the health and medical side of the ODs (MoH) are separate, there is a need for more harmony and collaboration to ensure a good balance. Otherwise, national priorities and targets do not overlap or fall short because each actor has a private data collection that is not open to access by the other party. The goals of the actors have to be aligned deliberately, otherwise OD surveillance and thus prevention and protection activities are weakened.

Another outcome of harmony and collaboration between all actors is the formation of new instruments beneficial for the implementation of legislation. The existence of legislation is not enough. It should be correctly understood, accepted, and applied by all actors. Examples of good practices are the codes of practice established by the employees and employers along with the public institutions on a sectoral basis [41], counselling and guidance provided by OSH services, information and training activities by public and private institutions, occupational organizations and associations of professionals and patient groups [42].

It is also seen that the universities and scientific research institutions collaborate in occupational health units or in the provision of occupational health services [7], thus strengthening capacities and developing collaboration between countries [43] or in the region [44].

4.4. Statistics and reporting

A well-performing OD notification and registration system can provide valuable analyses for preventive occupational health practices. It can allow to make inferences on social and economic issues and for employees working under high risk or requiring special care. Studies can be conducted to evaluate the system itself. It can provide a key methodology at systemic level through making use of international comparisons and good practice examples. However, the data must be prepared on a sectoral basis or on the level of care and the kind of ODs found. The definition and diagnostic facilities and guidelines as well as notification and reporting criteria must be standardized or comparable [32].

Good practices show that OD data can be collected and analyzed at national level by a cluster (i.e. sectoral initiatives including employer and employee representatives, or data collected from different sources like occupational physicians, family physicians, and various medical specialists) in accordance with sectoral needs and the nature of the study area [39]. Well-chosen samples can decrease the costs and increase the data quality substantially.

Open access libraries and "dedicated independent research and assessment" units have an important added value in providing evidence-based policy options based on data collection on-site supported with literature reviews, offering inferences for sectoral-based practices and guidelines, carrying out scientific studies at national and international level, and contributing to the literature [45].

4.5. Awareness and trainings

Another key component for a successful OD surveillance system is involvement of all actors with correct and sufficient knowledge

Please cite this article as: Şen S et al., Prevention of Occupational Diseases in Turkey: Deriving Lessons From Journey of Surveillance, Safety and Health at Work, https://doi.org/10.1016/j.shaw.2019.09.006

about the ODs through regular trainings, supplemented by online information sources. In a study analyzing the effect of training on identification and reporting of ODs, it was shown that problem-oriented models based on peer teaching such as a one-day active multifaceted workshop produce successful results [46]. On the other hand, other studies show that trainings of occupational physicians generally may not serve as a primary incentive for increasing OD notification, and that financial incentives may produce better results [6].

Common Health and Safety Units in Turkey undertake risk assessments, preventive actions through improving working conditions and providing information and education to workers, managers, and professionals. Another option is to improve the quality of services in these institutions enabling them to undertake additional functions similar to those of their counterparts abroad like providing workplace promoting activities (e.g. ergonomic solutions) and contributing to scientific studies in collaboration with universities or research institutions, and so necessary incentives and support must be provided. Accreditation of occupational health services and of occupational physicians' trainings can also support safer and healthier work environments, and protection of public health (healthy lifestyles).

In conclusion, from a government perspective, it must be aimed to address all stages of the interventions for the follow-up and prevention of ODs, such as planning, implementation, and assessment, and to ensure coordination between stakeholders. In the countries analyzed, institutions tend to carry out planning and have perspectives in accordance with their own targets and objectives. A holistic approach needs to be taken for the same national target, i.e. the development of active and sustainable OD surveillance models suitable for the country resources and ecosystem. With the outcomes of adequate OD surveillance systems, prevention programs can be prioritized and implemented focusing on specific serious risk factors or OD groups, or on specific high-risk sectors and branches of industry, or on combinations. All related units, especially universities, must be enabled to conduct well-designed studies, e.g. through special Research and Development programs [47] in accordance with the national OD prevention programming, ending in evidence-based recommendations. All studies must be worker-oriented, and it must be inculcated in the stakeholders as part of advocacy that the human factor is the most important resource of the countries. Public units must explicitly show the stakeholders how they maintain trust and impartiality. In Turkey, the MoH must take a more effective role in prevention of ODs thanks to its experiences gained from the Health Transformation Programme [48], instruments that bring together industrial sectors and health care units seeking multisectoral solutions to problems [49], and surveillance models developed for various prevention and protection programs.

Conflicts of interest

All authors have no conflicts of interest to declare.

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Please cite this article as: Şen S et al., Prevention of Occupational Diseases in Turkey: Deriving Lessons From Journey of Surveillance, Safety and Health at Work, https://doi.org/10.1016/j.shaw.2019.09.006